

SPACE RESEARCH COORDINATION CENTER



NASA FACILITIES GRANT NO. NsG(F)- 13

FINAL REPORT

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UNIVERSITY OF PITTSBURGH
PITTSBURGH, PENNSYLVANIA

18 NOVEMBER 1965

From the

MEMORANDUM OF UNDERSTANDING

between NASA and the University of Pittsburgh

" . . . The University of Pittsburgh has requested NASA support for the construction of the additional space research facilities described in Proposal SC 5398-F. It is contemplated that the new facilities will provide approximately 43,000 gross square feet of space science laboratories, including an area for the spin-off development program. These facilities will be contained in a separate building to be located on land owned by the University on its Oakland Campus. The location of these facilities, adjoining the Physics Complex, the Schools of Engineering and Mines, and the University Health Center, and only one block distant from the Natural Sciences Quadrangle and the Division of Social Sciences will measurably extend the areas of interdisciplinary cooperation and thus contribute to the cross-fertilization of ideas, thereby enhancing the research potential of the entire program. This building will enable the University to conduct its space-related research with improved efficiency. It will make possible closer coordination of and cooperation between research groups working in related areas. It will permit the use of facilities held in common between them. This regrouping of current space-research activities, made possible by the new building's additional space, will strengthen the University's capabilities of expanding its program in these fields. The University expects that the proposed facilities will be increasingly utilized by Governmental sponsors for space-related research throughout the ten-year period following completion of construction . . . "

James A. Webb (signed June 4, 1963)
Administrator, NASA

Edward H. Litchfield (signed May 6, 1963)
Chancellor, University of Pittsburgh

NASA Facilities Grant NsG(F)-13

Final Report

Submitted for the
University of Pittsburgh by

David Halliday

David Halliday, Acting Director
Space Research Coordination Center;
Dean, Division of the Natural Sciences

William G. Fisher

William G. Fisher, Director
Physical Plant

Paul Solyan

Paul Solyan, Comptroller



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I. CHRONOLOGY

1. Application: On June 22, 1962, the University of Pittsburgh submitted a proposal to the National Aeronautics and Space Administration for the construction of a Space Research Coordination Center building. After extended discussion, the University entered into an agreement with NASA to develop (1) strong, multidisciplinary, space-related research programs in science and engineering, and (2) a mechanism to encourage spin-off of space-generated technology into the economy. This agreement was formalized in a Memorandum of Understanding signed on May 6, 1963, by the Chancellor of the University and on June 4, 1963, by the Administrator of NASA. The portion of the Memorandum that deals with the facility appears on the inside front cover.

2. Award of grant: On June 20, 1963, NASA implemented a provision of the Memorandum of Understanding by providing a Facilities Grant NsG(F)-13 in the amount of \$1,500,000 to the University of Pittsburgh to construct a building for its Space Research Coordination Center.

3. Planning: The architectural firm of Deeter & Ritchey had been engaged in April 1963, to prepare preliminary plans, specifications and cost estimates for the proposed building. Upon award of the grant, the firm was asked to proceed with this work. Representatives of the Lewis Research Center reviewed the plans at various stages and made many valuable suggestions. Final plans and specifications were completed on December 28, 1963. The grant of \$1,500,000 was budgeted as follows:

a. Construction and fixed equipment	\$1,315,000
b. Architectural and engineering services	106,000
c. Contingency	69,000
d. Surety bonds and fire insurance	10,000
	<hr/> \$1,500,000

4. Awarding of contract: On January 3, 1964, a selected list of pre-qualified contractors was invited to bid and sealed bids were accepted on January 29, 1964, under the separate categories of General; Plumbing; Heating, Ventilating and Air Conditioning (HVAC); and Electrical. The bidders, all of whom are from Pittsburgh or its suburbs, and their submitted bids are shown in Appendix A.

The General Contract was awarded to the lowest bidder in this category, the Dick Corporation of Large, Pennsylvania, on February 20, 1964. The lowest Plumbing, HVAC and Electrical bidders were assigned to the Dick Corporation at their bid prices. The General Contractor (Dick) included a fee in his bid for accepting the three subcontractors assigned, coordinating their work and accepting full responsibility for all work covered by the Plans and Specifications. The amount of the General Contract was \$1,314,980, which is the sum of the four lowest bids in each category plus \$32,795 in accepted alternates, not reflected in the listed bids.

5. Construction and occupancy: The General Contractor was authorized to start work on February 24, 1964, and the cornerstone was laid on June 2, 1964. The building was accepted on May 17, 1965, two days earlier than the contract completion date of May 19, 1965. A few items on the punch list remained and several late change orders had not been accomplished as of that date; all of these items were completed by October 10, 1965. The building was dedicated on November 18, 1965, at which date it was essentially fully occupied.

II. FINANCIAL SUMMARY

October 10, 1965

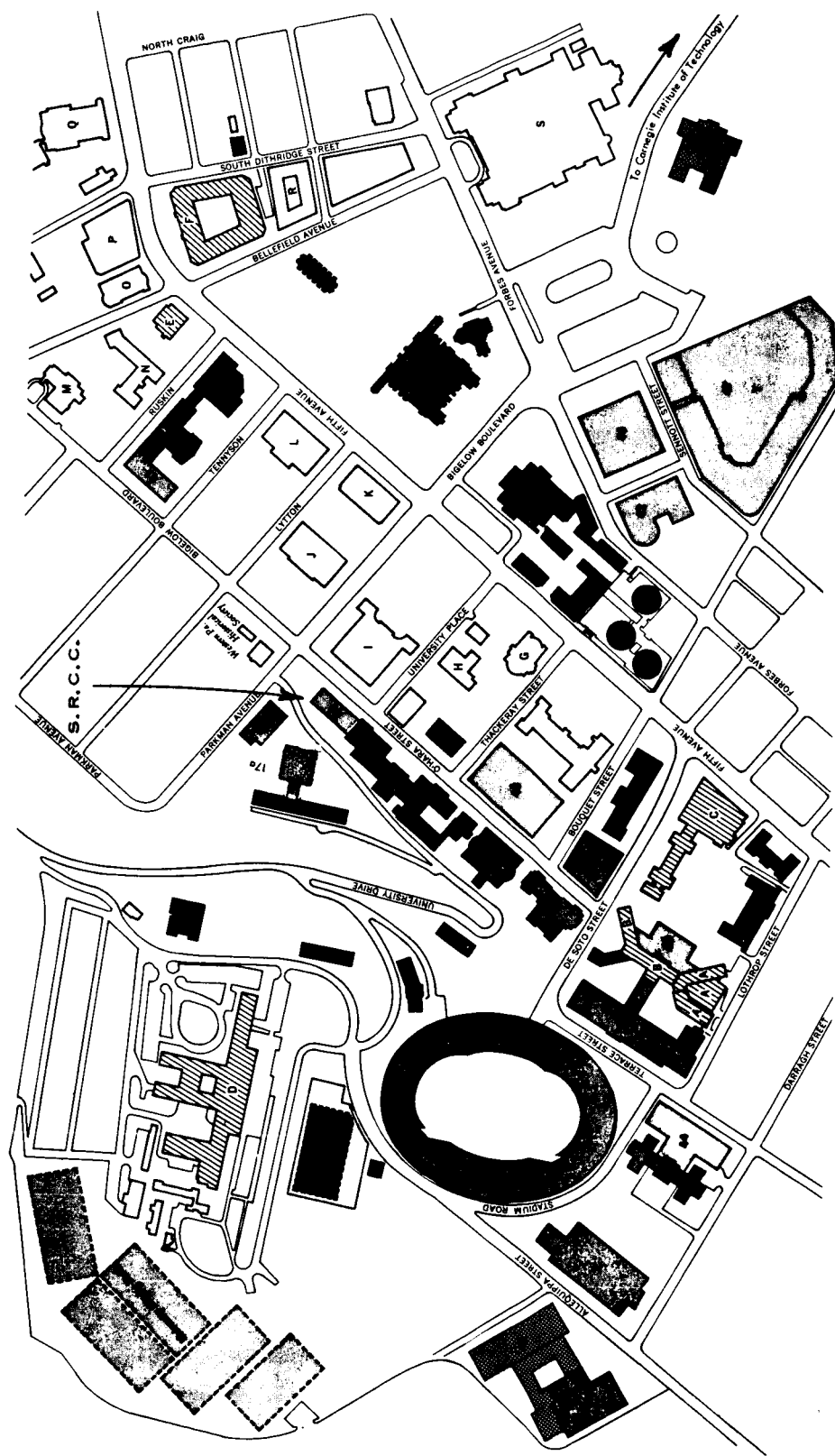
1. Construction and fixed equipment		\$1,382,243.64
2. Architectural and engineering services		
Architect's fee	\$ 85,807.60	
Surveys	712.50	
Test borings	1,314.47	
Soil testing	455.45	
Renderings	320.00	
Clerk of the Works	14,943.27	
Photographs	74.00	
	<u>\$103,627.29</u>	103,627.29
3. Surety bonds and fire insurance		8,103.49
4. Miscellaneous fixed equipment		
Power center gear	\$1,000.00	
Fire extinguishers	1,382.65	
Building sign	300.00	
	<u>\$2,682.65</u>	<u>2,682.65</u>
5. Total		\$1,496,657.07
6. Contingency (refunded)		<u>3,342.93</u>
7. Amount of grant		\$1,500,000.00

The cost per square foot (gross) is \$1,497,000/42,600 square feet or \$35.14.

III. BUILDING LOCATION

To fulfill the University's agreements under the Pitt-NASA Memorandum of Understanding, it was necessary to locate the building to provide easy access to the physical science and engineering departments of the University. The plot plan shows the selected location. Note that the building is physically connected (at four levels) to a complex of five interconnected buildings devoted to physics and engineering. With the completion of the \$14,200,000 Engineering building, for which ground will be broken in March 1966, all of the buildings in this complex will be assigned to the Physics Department. In addition, the engineering departments, now scattered over a hilly campus, will be combined in the single large engineering building. A new \$3,500,000 chemistry building (financed and in the final planning stage) will triple the floor space assigned to chemistry. It is planned to connect the SRCC building to the IBM-360 computer now being installed in the University's Computation and Data Processing Center by a remote console.

The life science departments, the Mathematics Department, the Health Center, the Mellon Institute, the Carnegie Library, the University's new Hillman Library and the Carnegie Institute of Technology are all within easy walking distance.



UNIVERSITY OF PITTSBURGH

- 31 Cathedral of Learning (Computing Center)
- 5 Scaife Hall (Health Professions)
- F Mellon Institute
- 46 Hallman Library
- S Carnegie Institute
- A, B, C, D Hospitals

- 40 Space Research Coordination Center
- 19, 20, 21, 22, 23 Physics Buildings
- 43 Engineering
- 17, 17a Chemistry
- 34, 35, 41 Life Science Buildings
- 25 Schenley Hall (Mathematics)

- UNIVERSITY BUILDINGS
- FUTURE UNIVERSITY BUILDINGS
- AFFILIATED INSTITUTIONS



IV. DESIGN REQUIREMENTS

1. Research laboratory requirements: The building must provide laboratories and auxiliary technical and office areas for basic research programs in space-related research. The following specific technical requirements were established:

- a. All spaces must be modular and relatively easily modified.
- b. Utility services must be available in all spaces, in a modular arrangement to work with the modular spaces, and easily modified in all spaces.
- c. All laboratory spaces must be equipped, with utilities extended to point of use.
- d. Offices must be convertible to laboratories and vice-versa.
- e. The overall building power requirement is a 750-KVA electric service, with room for doubling transformer capacity, and with 400 amp - 3 ϕ bus duct taps available at all laboratories.
- f. Special electrical requirements for physics laboratories include surface metal raceways with receptacles at the perimeter of the lab, supplying:

- 120 v - 1 ϕ regulated and standard
- 208 V - 1 ϕ and 3 ϕ standard
- All circuits grounded
- Color coded circuits and receptacles.

The need for regulated power has been established by experience with equipment malfunction in similar research programs, particularly at times of peak power loads in the city.

- g. An all air-conditioned building with a zone and control at each laboratory is called for; the relative humidity will be maintained at 50 per cent; the air filtering system shall be of high efficiency and a separate fume hood exhaust system shall be available to all spaces.

- h. Hot and cold water, compressed air, natural gas and acid waste lines are to be available to all spaces, with oxygen lines in selected laboratories.
- i. Transmission of vibration to the building from fans, motors, air handling units, etc., shall be limited by spring-type isolators to 1 per cent of the vibration amplitude that would be present without such isolators.
- j. Non-magnetic materials are required in selected laboratories.
- k. Electrical fixtures shall be shielded and shall provide 55-80 footcandles of illumination on working surfaces.
- l. The available live load at all floors shall be at least 150 lb/sq ft.
- m. The roof must be available for observations and experiment. This area is to serve as a testing area for instruments designed for observation of the upper atmosphere of the night sky and planned for eventual use in the University's Upper Atmosphere Observatory in the nearby Laurel Mountains.

2. Knowledge Availability program requirements: The Knowledge Availability Systems Center should be located as a self-contained unit in a quiet part of the building. At the same time it must have ready access to the rest of the building to facilitate interaction between the staff of the Center and the scientists and engineers in the building. The requirements are (a) a suite of offices, (b) provision for record storage, (c) provision for the installation of a computer console and other information retrieval hardware, and (d) a seminar room for meeting with representatives of the regional industries served by the Center.

3. The building specifications: The requirements listed above were met by a building with these design characteristics.

The building is a five-story structure of 42,600 sq. ft. (gross) and a net useable area of 55.7% or 23,830 sq. ft. Note that the

Memorandum of Understanding calls for "approximately 43,000 gross square feet."

A central corridor serves all rooms, widening into an entrance area at the ground floor. It is wide enough (7'-0") for movement of bulky items of equipment and to serve as an auxiliary discussion space, being equipped with chalkboards and tackboards.

Vertical movement is by means of two stairs at extreme ends of building, and by a combination passenger-freight elevator of 6,000 lbs. capacity. It is 7'-0" wide by 10'-0" deep, with a rear opening to a delivery dock.

Laboratory spaces are 22'-0" x 22'-0" modules, with half-modules of 11'-0" x 22'-0" used as laboratories, special purpose rooms (darkroom, storage) and offices.

Mechanical stacks of uniform size are placed outside of exterior wall at centerline of each module. Stacks contain building return-air, fume hood exhausts, acid waste lines, and electrical conduit. Stacks are accessible for making modifications of these systems and include connections for future addition or severing of systems, and are arranged so that subdividing partitions do not interfere with services.

Electrical buses and utility mains run exposed through all spaces parallel to corridor, with valves at each laboratory module for easy modification of each laboratory utility system. Distribution lines in each laboratory run exposed in the walls above workcounter; acid-waste drains run exposed below workcounter. The exposing and orderly arrangement of these service mains makes the continuous modification typical of this basic research laboratory a simple operation.

Main air supply ducts are above corridor ceilings, with distribution through mixing boxes exposed in laboratories.

Modification of laboratory air supply system is easily made.

Voltage regulation is supplied by 5 KW Sorenson & Co. units, model 5000S, complete with rack and output voltmeter. The input rating is 93 - 130 volts AC, single phase, 60 cycle \pm 10%. The output is 115 volts AC, adjustable to an accuracy of 0.1%.

Concrete was chosen as the structural-architectural material, providing division of architectural spaces as well as structure. Economic demands led to the exploiting of superior quality poured-in-place concrete as finished and exposed elements; ribbed floors are exposed as ceilings, exterior wall-columns enclose mechanical chassis, interior wall-columns become part of corridor walls. Brick and block masonry walls enclose exterior between concrete elements.

Laboratory fixed equipment includes a complete installation of steel and wood base and wall cabinets with composition stone countertops; and includes acid cup sinks, stainless steel sinks, and chemical fume hoods. The installation is tailored to the requirements of each laboratory user.

Some of the special functional features incorporated include:

A regular pattern of bolt inserts cast in the ceiling concrete providing for screw attachment of steel hanger rods used for suspending apparatus and hoisting beams.

Large, pivoted windows, two per module, removable for installation of bulky items through the exterior wall. This operation is facilitated by including a hoisting beam that may be bolted between exterior column faces at roof over any pivoted window, for lifting from grade level.

Two non-magnetic laboratories with non-ferrous materials.
A Van de Graaff laboratory with an additional two feet of ceiling height and electronic shielding.

A wooden deck of 1,130 square feet area at the pent-house roof with ladder and hatch for access, providing a station for atmospheric observations.

V. USE OF THE FACILITY

1. The Space Research Coordination Center: This research laboratory building houses the space-related programs of the Department of Physics, associated programs of the Departments of Chemistry and Metallurgy, much of the research arm of the Department of Earth and Planetary Sciences, the Knowledge Availability Systems Center and the headquarters of the Space Research Coordination Center.

The Space Research Coordination Center, established in January 1963, coordinates space-oriented research in the various schools, divisions and centers of the University of Pittsburgh. Members of the various faculties of the University may affiliate with the Center by accepting appointments as Staff Members. Some, but by no means all, Staff Members carry out their researches in the Space Research Coordination Center building. The Center's policies are determined by an SRCC Faculty Council.

The Center provides partial support for space-oriented research, particularly for new faculty members; it awards annually a number of postdoctoral fellowships and NASA predoctoral traineeships; it issues periodic reports of space-oriented research. In concert with the University's Knowledge Availability Systems Center it seeks to assist in the orderly transfer of new space-generated knowledge into industrial application.

The Center is supported by a Research Grant (NsG-416) from the National Aeronautics and Space Administration, strongly supplemented by grants from The A. W. Mellon Educational and Charitable Trust, the Maurice

Falk Medical Fund, the Richard King Mellon Foundation and the Sarah Mellon Scaife Foundation. Much of the work described in SRCC reports is financed by other grants, made to individual faculty members.

2. Research Activities: The research activities in the building, exclusive of the Knowledge Availability Systems Center, fall into twelve major classifications:

1. Observational aeronomy
2. Laboratory aeronomy and astrophysics
3. Atomic collisions in plasmas
4. Ion technology
5. Theoretical atomic physics
6. Chemical kinetics
7. Meteorite, tektite and lunar studies
8. Materials
9. Magnetism
10. Geophysics
11. Mass spectroscopy
12. Experimental petrology

Some of the researches are purely terrestrial in character but, as pointed out by Professor Jastrow, there are real advantages in taking as a proper system for study one that starts at the center of the earth and extends outward without limit and in grouping in one building or administrative unit staff members from the disciplines (Earth Sciences, Chemistry, Physics and Astronomy, for example) that have a logical concern for such studies. Two local examples suffice: (1) It makes sense to group together scientists interested in rock magnetism (Fuller and Nagata) with those interested in core and space magnetism (Donahue,

Inoue and Nagata). (2) It makes equal sense to group together scientists interested in meteorite and tektite studies (Cohen and collaborators) with those interested in experimental petrology (Yagi and Onuma).

The detailed nature of the programs in the above categories is indicated by the selected list of recent publications appearing in Appendix B.

3. Knowledge Availability Systems Center: This Center, whose headquarters are in the Space Research Coordination Center building, is devoted to solving problems of communication among and between scholars and practitioners in the several fields of knowledge. In announcing the new Center, the University enunciated its institution-wide commitment in the field of information storage and retrieval as a five-faceted approach: (1) research, operations, and teaching; (2) learning research and development; (3) media development; (4) continuing education; and (5) the broad field of communications.

- a. Space and Technology Transfer: The University's Space and Technology Transfer program undertaken by the Knowledge Availability Systems Center under contract with the National Aeronautics and Space Administration, is designed to assemble, via computer, information relating to aerospace projects and to disseminate that information selectively to industrial corporations.

The information dissemination program has a three-fold impact on participating companies: (1) it suggests new applications for existing products; (2) it points the way for future research and development; and (3) it informs management of current aerospace requirements.

Faculty members of the School of Engineering help to interpret the needs of local companies and to pinpoint applicable research findings. Swift computerized searches for relevant information are made possible through the facilities of the Computation and Data Processing Center.

At the present time the program serves forty-eight companies. Although most of them are regional, there is now representation from seven states in addition to Pennsylvania (California, Massachusetts, Michigan, Ohio, New Jersey, New York and West Virginia).

The KAS Center also carries out other research programs and projects which are relevant to the Space and Technology program either directly or indirectly (by increasing the general capability of the Center in the information-handling field). Some of these projects are listed below.

- b. Relevance Studies: The purpose of the relevance investigations, conducted by the Knowledge Availability Systems Center and sponsored under a grant from the National Institutes of Health, is to discern the similarities and differences in the ways in which different individuals consider printed information relevant to their questions. It is hoped that the results of this program may provide clues for improving methods of collecting, arranging, and disseminating needed information.
- c. Notation Study: A line-formula chemical notation was developed by W. J. Wiswesser as a concise manner of representing chemical structures. Because the Wiswesser notation permits a linear representation of two- and three-dimensional structures of chemical compounds, it is possible to store each compound in computer-processable form and to perform a variety of operations on these compounds. Because most chemists are not familiar with the Wiswesser notation and are accustomed to looking at graphic representations of the structures of molecules, an IBM 7090 computer program has been developed for converting a Wiswesser notation to its corresponding chemical structure.
- d. The University of Akron Project: The Division of Rubber Chemistry of the American Chemical Society has sponsored the development of a mechanized information retrieval system in the fields of rubber, thermoplastics, and synthetic fibers. The University of Akron was selected to operate this program. The Knowledge Availability Systems Center is providing technical direction for the program.
- e. Specialized Information Centers Survey: Various attempts have been made during the past several years to list specialized information centers and to characterize them by subject coverage, type of service provided, and other descriptive criteria. Apparently, however, there has been no attempt made to analyze unit operations performed in the various centers in

order to discern similarities and differences, leading to the emergence of principles. Accordingly, a survey of a sampling of these centers was undertaken at the Knowledge Availability Systems Center in an attempt to discern the anatomy of this field.

- f. Center for International Biomedical Communications Research: A Center for International Biomedical Communications Research has been established jointly by the University of Pittsburgh and the Excerpta Medica Foundation of Amsterdam, Holland. Its objective is the development of new international communication tools and techniques which will provide the practicing physicians and the medical researchers in the U.S.A. and other countries with rapid access to important scientific findings announced anywhere in the world. The new Center which will be located at the Knowledge Availability Systems Center represents an attempt to combine medical, scientific, and technical resources essential for the development and implementation of an effective program for improving international medical communication.

III. COST OF CONSTRUCTION

General Contractor's Contract Sum - February 20, 1964 -- \$1,314,980.00

<u>C.O. No.</u>	<u>Date</u>	<u>Nature of Change</u>	<u>Amount</u>
1	6/30/64	Additional work on caissons	\$ 460.28 +
2	6/30/64	Change five hollow metal doors to "B" label	218.50 +
3	7/2/64	Installation 2" steam line 1-1/2" condensate return line to manhole in University Drive	8,190.39 +
4	8/4/64	Additional reinforcing for certain beams	184.00 +
5	9/23/64	Various changes to the electrical system	1,053.00 -
6	10/29/64	Revision to parking lot flood-lights	132.25 +
7	10/29/64	Wood sleeper supports for gratings on penthouse roof; furnishing and installation of 14,747 sq. ft. of VAT; stair treads; revision to chalk boards and tack boards	7,639.09 +
8	11/17/64	Deletion 20 type "Y" fixtures; revise existing rainwater conductor at Thaw Hall; addition of Belgian Block to slope at service drive entrance	212.10 -
9	12/22/64	Tax exemptions on chalkboards, lab equipment and certain electrical equipment	2,846.53 -
10	12/23/64	Removing radiators in passageway to Thaw Hall; additional solid concrete block shielding; installation of 6" rubber base; revision electrical panel boards in certain labs	4,466.45 +

<u>C.O. No.</u>	<u>Date</u>	<u>Nature of Change</u>	<u>Amount</u>
11	1/11/65	Metal cabinets for 15 voltage regulators; 2 additional fume hoods; 15 dolly mounting for voltage regulators; certain electrical changes	\$ 9,563.30 +
12	3/3/65	Installation protective angle at glass piping, all labs; furnish and install additional voltage regulator; revision to rain-water conductor and terra cotta drain	6,581.45 +
13	3/10/65	Safety rail along University Drive; cover plate along Stair "A"	2,247.15 +
14	4/20/65	Catwalks on each side of Pent-house above return air ducts; extension of utilities at East and West walls of L-300, 301 and 318; furnish and install light-proof shades in certain labs; projection screen in L-215; aluminum safety rails alongside glass wall 5th floor corridor; furnish and install 19 storage cabinets; additional cup sinks in certain labs	22,427.18 +
15	5/17/65	Tax credit; install rail around front entrance; additional painting of conduits	1,329.00 +
16	5/25/65	Furnish 12 compressed air filters and stands; vertical blinds for certain offices; aluminum card holders each room and lab	2,407.18 +
17	6/29/65	Relocate elevator disconnect switch; furnish and install condensate pumps; credits for tile and electrical changes plus tax exemption; additional work on rear service drive	5,529.05 +

Total Construction Contract

\$1,382,243.64

VII. CERTIFICATE OF COMPLETION

Deeter & Ritchey Architects 4 Gateway Center Pittsburgh, Pennsylvania 15222 Phone 391-4850

September 24, 1965

Mr. William G. Fisher
Director of the Physical Plant
University of Pittsburgh
Cathedral of Learning
Pittsburgh, Pa. 15213

#1129 - University of Pittsburgh - Space Research Coordination Center -
Contract

Dear Mr. Fisher:

The Space Research Coordination Center Building has been completed in accordance with Contract Drawings and Specifications, to the best of our knowledge.

Very truly yours,

DEETER & RITCHEY ARCHITECTS



Frank Knoble
Associate

mjk

VIII. Cornerstone Laying

The cornerstone of the facility was laid at 11:30 A.M. on June 2, 1964. Dr. John Geise, Vice Chancellor for Regional Programs, presided and brief remarks were made by:

The Honorable Hugh D. Scott
United States Senate

The Honorable James G. Fulton
United States House of Representatives

The Honorable William S. Moorhead
United States House of Representatives

Dr. Thomas L. K. Smull
Director, Grants and Research Contracts
Office of Space Sciences
National Aeronautics and Space Administration

General Harris B. Hull
Special Assistant to the Administrator
National Aeronautics and Space Administration

Dr. Edward H. Litchfield
Chancellor of the University

The audience consisted of representatives of local business and industry, philanthropic foundations, faculty, administration, students and the general public.

A sealed box placed within the stone contained:

1. A copy of the NASA enabling legislation (Public Law 85-568, National Aeronautics and Space Act of 1958).
2. A copy of the University's proposal to NASA (1962) which resulted in the establishment of the Space Research Coordination Center.
3. A copy of NASA Facilities Grant NsG(F)-13, including the NASA-University Memorandum of Understanding, under which this building was financed.
4. A program of the cornerstone-laying ceremony.

5. An iron meteorite collected in Argentina by Mr. Theodore Bunch of the Department of Earth and Planetary Sciences, along with a complete description.

The following telegram was read by Chancellor Litchfield:

The dedication of your new Space Center, and the comprehensive program of space-oriented activity which you have established, mark an important milestone in the life of the University of Pittsburgh and in the long story of Appalachia. I congratulate you for your vision in recognizing what can be done, and commend you for your industry in carrying forward your plans.

What you have set out to do in your area deserves widespread attention. You have focused the interest of the region's industries on the practical aspects of the space sciences. Your faculty and administration have concentrated conscientiously upon making the results of space-oriented research useful. By so doing they have added to our store of scientific knowledge for the future.

Yours is the kind of enterprise which has resulted in successful cooperation of the Federal Government with local groups. The University of Pittsburgh may take pride in its exertion of the constructive community leadership necessary in our joint efforts to build a truly Great Society.

I know you will sustain your good work in the years ahead.

Lyndon B. Johnson

The photo on the following page shows, left to right, Congressman William S. Moorhead, General Harris B. Hull, Chancellor Edward H. Litchfield, Senator Hugh D. Scott, Dr. Thomas L. K. Smull, and Congressman James G. Fulton.



IX. DEDICATION

The facility was dedicated on November 18, 1965, at a ceremony attended by 120 representatives of local industry, foundation representatives, political leaders and selected members of the faculty and administration. Dr. John Geise, Vice Chancellor for Regional Programs, presided. Dr. Homer E. Newell made the principal address and presented Acting Chancellor Stanton C. Crawford with a dedicatory plaque which is now mounted in the lobby of the Space Research Coordination Center building. Acting Chancellor Crawford, in accepting the plaque expressed the University's appreciation of NASA support. Dean David Halliday, Acting Director of the Space Research Coordination Center, gave an overview of the activities housed in the building. He was followed by Professors Thomas Donahue, Alvin Cohen and Allen Kent who gave capsule presentations of their own programs which are respectively in physics, geochemistry and information retrieval. Dr. Howard L. Gerhart of the Pittsburgh Plate Glass Company made the final presentation; he emphasized the importance of space-related research to local industry with some emphasis on the Space and Technology Transfer program.

After the ceremony, the building was opened for inspection. Page 25 shows the selected laboratories that were part of the inspection tour.

The dedication ceremony received extensive coverage on radio, television and by the press.

This research laboratory building, made possible by a grant of \$1,500,000 from the National Aeronautics and Space Administration to the University of Pittsburgh, houses the space-related programs of the Department of Physics, associated programs of the Departments of Chemistry and Metallurgy, much of the research arm of the Department of Earth and Planetary Sciences, the Knowledge Availability Systems Center and the headquarters of the Space Research Coordination Center.

The Space Research Coordination Center, established in January, 1963, coordinates space-oriented research in the various schools, divisions and centers of the University of Pittsburgh. Members of the various faculties of the University may affiliate with the Center by accepting appointments as staff members. Some, but by no means all, staff members carry out their researches in the Space Research Coordination Center building. The Center's policies are determined by an SRCC Faculty Council.

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Program

John Geise

Vice Chancellor for Regional Programs

Homer E. Newell

Associate Administrator

Space Science and Applications,

National Aeronautics and Space Administration

Stanton C. Crawford

Acting Chancellor

David Halliday

Dean, Division of the Natural Sciences

Director, Space Research Coordination Center

Thomas Donahue

Professor of Physics

Alvin Cohen

Professor of Geochemistry

Allen Kent

Professor of Library Sciences

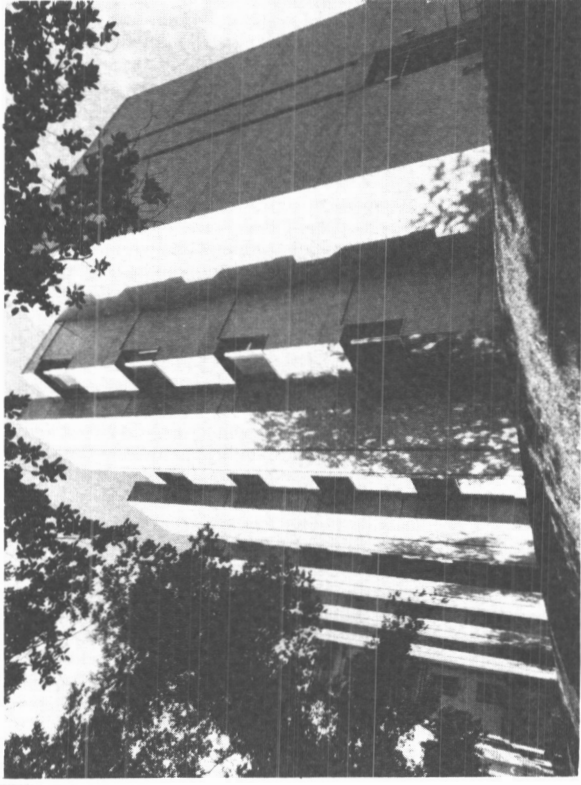
Director, Knowledge Availability Systems Center

Howard L. Gerhart

Director of Research & Development Center

Coatings and Resins Division

Pittsburgh Plate Glass Company



*Dedication of the
Space Research Coordination Center
University of Pittsburgh*

*Thursday, the eighteenth of November
Nineteen hundred and sixty-five
at Langley Hall, Room 223*

SPACE RESEARCH COORDINATION CENTER

FINANCED BY A GRANT TO THE
UNIVERSITY OF PITTSBURGH
BY THE NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION. BUILDING
DEDICATED ON NOVEMBER 18, 1965

\$1.5 Million Complex Dedicated

Pitt's New Space Center Seen U.S. Profit-Maker

By HENRY W. PIERCE

Post-Gazette Staff Writer

A federal space agency official said the government expects a 2-to-1 or 3-to-1 return on its investment in the University of Pittsburgh's new \$1.5 million Space Research Coordination Center which was dedicated yesterday.

Speaking at dedication ceremonies in the new space center building in Oakland, Dr. Homer E. Newell, an associate administrator with the National Aeronautics and Space Administration (NASA), called on Pitt scientists to exert "all of the vision, determination and dedication of which they are capable" on behalf of the space program.

Newell said the space agency is seeking new ways of working with Pitt and with Pittsburgh industries.

"Thus," he said, "we hope to get double or triple value, as it were, from each dollar of our investment."

the value of this research for space from its value for industry. Pittsburgh industries are in a position to find applications for the theories, concepts and discoveries that emerge from the center."

PITTSBURGH POST-GAZETTE
November 19, 1965
p. 8, c. 3-4

Newell cited Pitt research in upper atmosphere physics, meteorites, Earth magnetism, geochemistry and biology.

He also praised Pitt's Knowledge Availability Systems Center which is doing pioneering work in making hard-to-get facts, instantaneously available to scientists and engineers.

However, he defended a widely-criticized NASA practice of concentrating space research funds in Southern California and Boston. He said:

"An attempt at completely uniform geographic distribution is potentially as unwise as the concentration of effort in only a few schools. Some sections of the country have excellent universities clustered close together, while others have regrettably sparse academic concentrations."

In another address, a Pittsburgh Plate Glass Co. executive predicted industries here will make extensive use of research findings from the new space center.

Dr. Howard L. Gerhart, research and development director at the glass company's coating and resins division, said:

"It is impossible to separate

SPACE RESEARCH COORDINATION CENTER

Laboratories Open for Inspection

FIRST FLOOR

- 100 ATOMIC PHYSICS COLLISION CROSS SECTIONS (PROF. T. M. DONAHUE)
- 101 AERONOMY LABORATORY, ROCKET PAYLOAD (PROF. T. M. DONAHUE)
- 104 MASS SPECTROMETER LABORATORY (MR. A. G. SHARKEY)
- 107 ROCK MAGNETISM LABORATORY (PROF. M. FULLER)
- 113 ATOMIC PHYSICS AND AERONOMY (PROF. T. M. DONAHUE)

SECOND FLOOR

- 200 ATOMIC PHYSICS, PHOTOIONIZATION AND METASTABLE STUDIES (PROF. E.C. ZIPF)
- 201 ATOMIC PHYSICS AERONOMY DATA PROCESSING SYSTEM (PROF. E.C. ZIPF)
- 206 CHEMICAL AERONOMY, EXCITATION AND QUENCHING OF METASTABLE OXYGEN AND NITROGEN (PROF. F. KAUFMAN)

THIRD FLOOR

- 300,301 ATOMIC BEAM LABORATORIES (PROF. W. L. FITE)
- 306 ION-MOLECULE REACTIONS, PHOTOIONIZED PLASMA-AFTERGLOWS (PROF. M.A. BIONDI)
- 309 RADIATION TRANSPORT STUDIES, MICROWAVE PLASMA-AFTERGLOWS SPECTRAL LINE SHAPES (PROF. M. A. BIONDI)
- 318 ION TECHNOLOGY LABORATORY (PROF. W. L. FITE)

FOURTH FLOOR

- 402 ULTRASONIC SEISMIC MODEL LABORATORY (PROF. W. L. PILANT)
- 403 SEISMIC DIGITIZATION FACILITY (PROF. W. L. PILANT)
- 411 ROCK MAGNETISM LABORATORY (PROF. M. FULLER)

FIFTH FLOOR

- 503 METEORITE PETROLOGY (PROF. A. J. COHEN)
- EAST END OF FIFTH FLOOR KNOWLEDGE AVAILABILITY SYSTEMS CENTER (PROF. A. KENT)

X. FLOOR PLANS

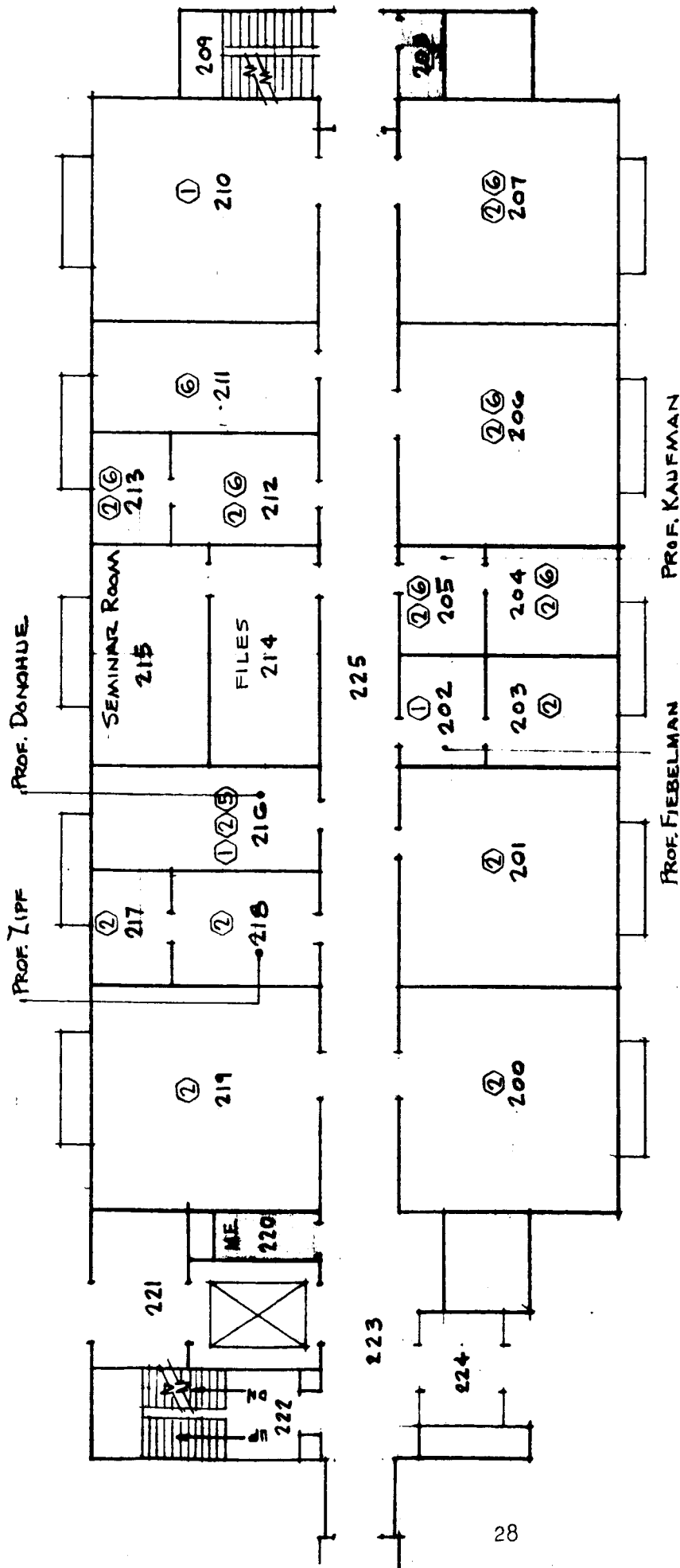
Floor plan of the second floor, showing various rooms and their dimensions. The plan includes a central corridor (121) and a staircase (106). Rooms are labeled with numbers and dimensions, and some are marked as 'M.E.' (Mechanical Equipment).

Rooms and Dimensions:

- 100: 20' x 11' (M.E.)
- 101: 12' x 11' (M.E.)
- 102: 12' x 11' (M.E.)
- 103: 12' x 11' (M.E.)
- 104: 12' x 11' (M.E.)
- 105: 12' x 11' (M.E.)
- 106: 12' x 11' (M.E.)
- 107: 12' x 11' (M.E.)
- 108: 12' x 11' (M.E.)
- 109: 12' x 11' (M.E.)
- 110: 12' x 11' (M.E.)
- 111: 12' x 11' (M.E.)
- 112: 12' x 11' (M.E.)
- 113: 12' x 11' (M.E.)
- 114: 12' x 11' (M.E.)
- 115: 12' x 11' (M.E.)
- 116: 12' x 11' (M.E.)
- 117: 12' x 11' (M.E.)
- 118: 12' x 11' (M.E.)
- 119: 12' x 11' (M.E.)
- 120: 12' x 11' (M.E.)
- 121: 12' x 11' (M.E.)

PROGRAM CATEGORIES

- J - Janitor
ST - Storage Room
ME - Mechanical Equipment



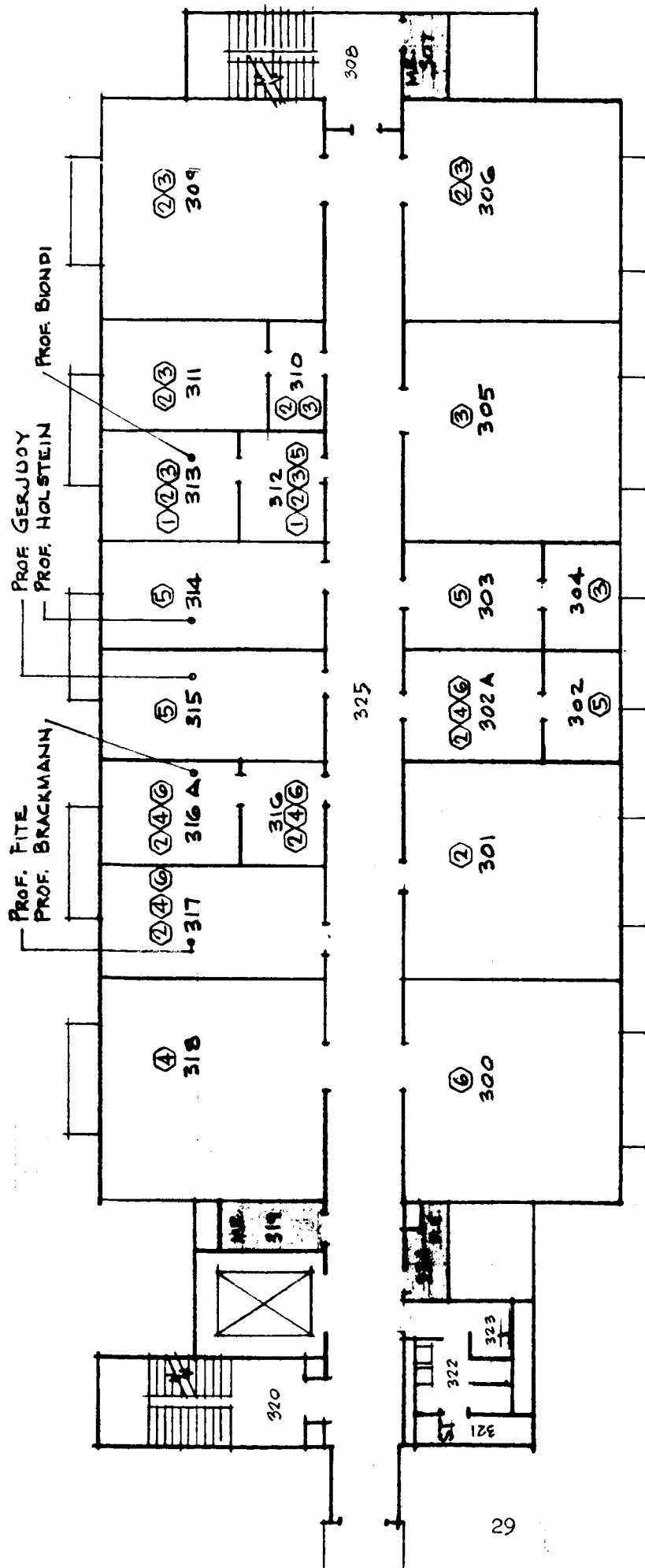
SECOND FLOOR

SCALE 1/16" = 1'-0"

PROGRAM CATEGORIES

- ① Observational aeronomy
- ② Laboratory aeronomy and astrophysics
- ③ Atomic collisions in plasmas
4. Ion technology
5. Theoretical atomic physics
6. Chemical kinetics
7. Lunar, meteorite and tektite studies
8. Materials
9. Magnetism
10. Geophysics
11. Mass spectroscopy
12. Experimental petrology
13. Knowledge Availability Systems Center

J - Janitor
ST - Storage Room
ME - Mechanical Equipment

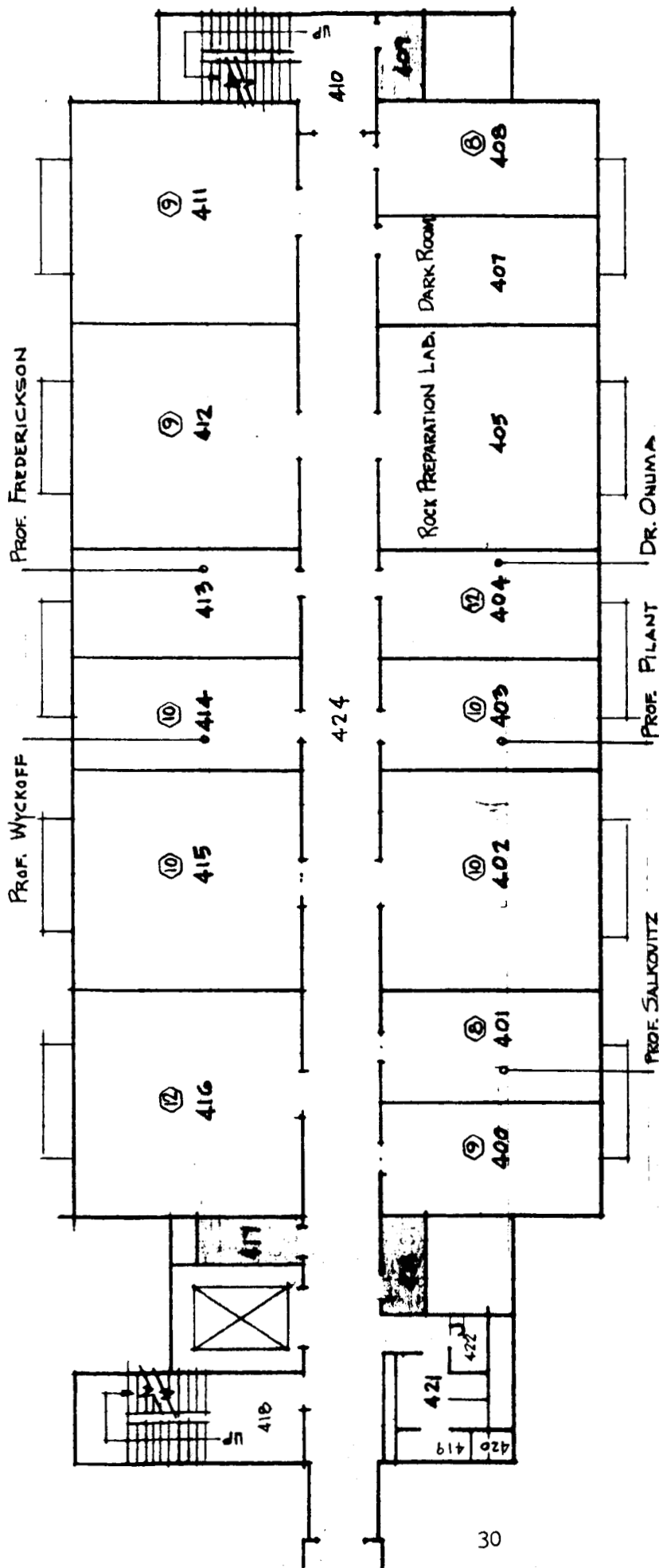


PROGRAM CATEGORIES

- ① Observational aeronomy
- ② Laboratory aeronomy and astrophysics
- ③ Atomic collisions in plasmas
4. Ion technology
5. Theoretical atomic physics
6. Chemical kinetics
7. Lunar, meteorite and tektite studies
8. Materials
9. Magnetism
10. Geophysics
11. Mass spectroscopy
12. Experimental petrology
13. Knowledge Availability Systems Center

J - Janitor
ST - Storage Room
ME - Mechanical Equipment

THIRD FLOOR
Scale 1/16" = 1'-0"

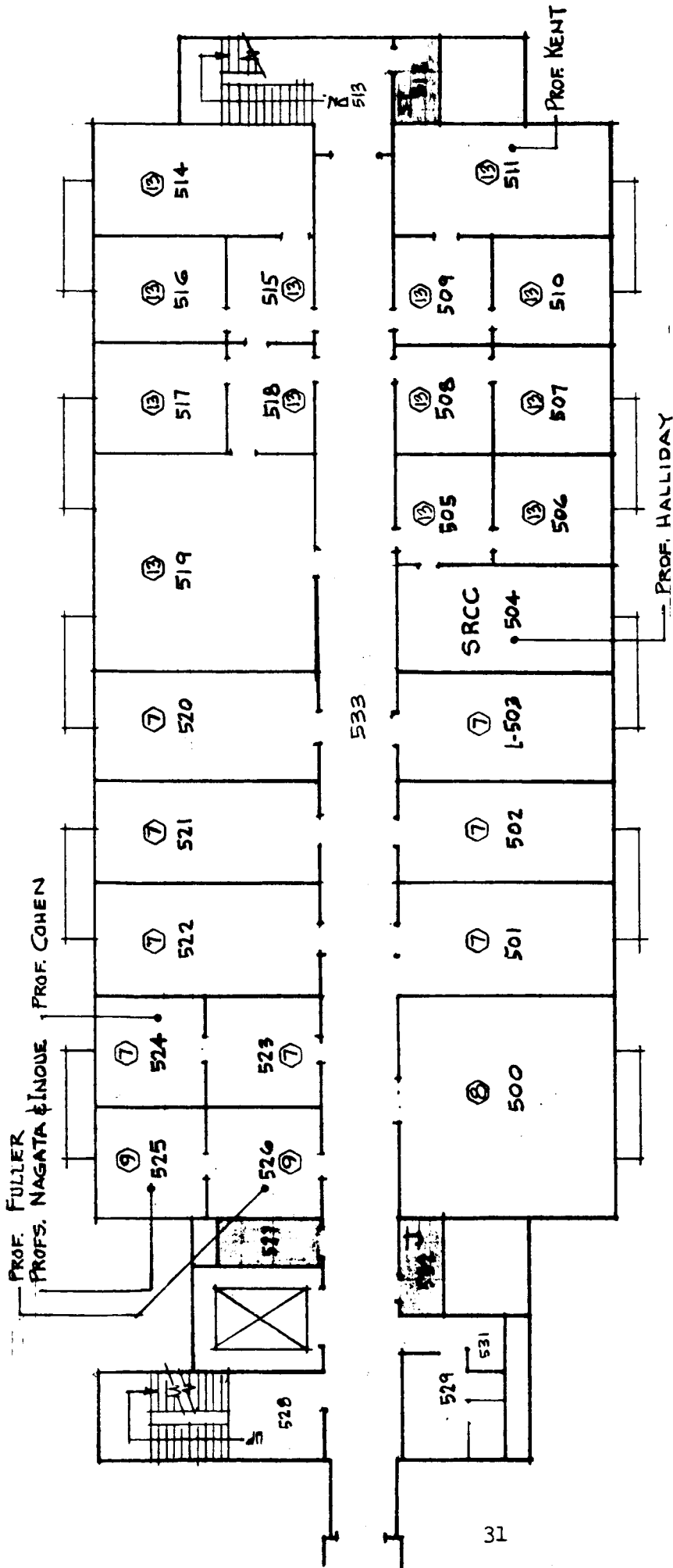


PROGRAM CATEGORIES

- ①. Observational aeronomy
- ②. Laboratory aeronomy and astrophysics
- ③. Atomic collisions in plasmas
4. Ion technology
5. Theoretical atomic physics
6. Chemical kinetics
7. Lunar, meteorite and tektite studies
8. Materials
9. Magnetism
10. Geophysics
11. Mass spectroscopy
12. Experimental petrology
13. Knowledge Availability Systems Center

J - Janitor
ST - Storage Room
ME - Mechanical Equipment

FOURTH FLOOR
SCALE 1/16" = 1'-0"



FIFTH FLOOR SCALE 1/16" = 1'-0"

PROGRAM CATEGORIES

- ①. Observational aeronomy
- ②. Laboratory aeronomy and astrophysics
- ③. Atomic collisions in plasmas
- ④. Ion technology
- ⑤. Theoretical atomic physics
- ⑥. Chemical kinetics
- ⑦. Lunar, meteorite and tektite studies
- ⑧. Materials
- ⑨. Magnetism
- ⑩. Geophysics
- ⑪. Mass spectroscopy
- ⑫. Experimental petrology
- ⑬. Knowledge Availability Systems Center

J - Janitor
ST - Storage Room
ME - Mechanical Equipment

APPENDIX A

Appendix A

List of bidders and submitted bids.

1. General

Dick Corporation	\$788,888
Charles F. Campbell, Inc.	806,000
Graziano Construction Co.	818,000
O. H. Martin Co.	823,800
Navarro Corp.	827,000
Missile Sites, Inc.	839,000
Martin and Nettrour	843,766
Crump, Inc.	874,000
Mellon-Stuart Co.	899,980
Ragnar Benson Inc.	910,000
Rea Construction Co.	949,400
George A. Fuller Co.	969,000

2. Plumbing

Ralph Plumbing and Heating Co.	\$120,189
Nass Corporation	130,000
Steel City Piping Co.	134,134
Penn Plumbing and Heating Co.	138,000
Schneider, Inc.	138,900
Limbach Co.	147,000
Coleman-Good Inc.	153,000
Wayne Crouse, Inc.	157,114

3. HVAC

Schneider, Inc.	\$164,900
Steel City Piping Co.	179,900
Limbach Co.	183,000
Coleman-Good, Inc.	189,000
Wayne-Crouse, Inc.	190,047
Ralph Plumbing and Heating Co.	191,161
J. R. Ruthrauff	191,987
Penn Plumbing and Heating Co.	195,700

4. Electrical

Frame Electric Co.	\$208,208
Consolidated Comstock Co.	217,200
Ross Electric Co.	226,700
E. C. Ernst	232,287
Lord Electric Co.	341,362

APPENDIX B

APPENDIX B

Recent Publications of Faculty Members Housed in the SRCC Building

Manfred A. Biondi

Afterglow Atomic Collision Processes

Atomic Collision Processes. The Proceedings of the IIIrd International Conference on the Physics of Electronic and Atomic Collisions, London, 22nd-26th July 1963. (M.R.C. McDowell, ed.), North-Holland Publishing Company, Amsterdam (1964), pp. 491-509.

Manfred A. Biondi

Electron-Ion and Ion-Ion Recombination
Annales de Géophysique 20:34, 1964

Manfred A. Biondi

Recombination of Ions and Electrons
Endeavour XXIV:40, 1965

W. H. Kasner and Manfred A. Biondi

Electron Ion Recombination in Nitrogen
Physical Review 137:A317, 1965

T. Robert Connor and Manfred A. Biondi

Dissociative Recombination in Neon: Spectral Line Shape Studies
Physical Review 140:A778, 1965

T. E. Bunch and Alvin J. Cohen

Shock Deformation of Quartz from Two Meteorite Craters
Geological Society of America Bulletin 75:1263, 1964

Alvin J. Cohen

Source of Gas Evolution from Lunar Crater Alphonsus
Nature 201:1015, 1964

A. M. Reid, T. E. Bunch and A. J. Cohen

Luminescence of Orthopyroxenes
Nature 204:1292, 1964

Alvin J. Cohen

Lunar Landscape Luminescence
Astronomical Journal 70:135, 1965

T. M. Donahue

Excitation of the Lyman- α in the Night Sky
Space Science Reviews 1:135, 1962

- T. M. Donahue and W. G. Fastie
Observation and Interpretation of Resonance Scattering of Lyman α and OI (1300) in the Upper Atmosphere
Space Research. Proceedings of the IVth International Space Science Symposium, Warsaw, June 3-12, 1963. (P. Muller, ed.), North-Holland Publishing Company, Amsterdam (1964), pp. 304-324.
- J. E. Blamont and T. M. Donahue
Sodium Dayglow: Observation and Interpretation of a Large Diurnal Variation
Journal of Geophysical Research 69:4903, 1964
- T. M. Donahue
Some Considerations Concerning Radiation Transport in the OI 1304 Triplet in the Upper Atmosphere
Planetary and Space Science 13:871, 1965
- Wade L. Fite and R. T. Brackmann
Scattering of Hydrogen Atoms by Deuterium Molecules
Atomic Collision Processes. The Proceedings of the IIIrd International Conference on the Physics of Electronic and Atomic Collisions, London (M.R.C. McDowell, ed.) North-Holland Publishing Company, Amsterdam (1964), pp. 955-963.
- W. L. Fite
Charge Transfer and Ion-Atom Interchange Collisions above Thermal Energies
Annales de Géophysique 20:47, 1964
- W. L. Fite and J. A. Rutherford
Negative Ions in Afterglows in Atmospheric Gases
Discussions of the Faraday Society 37:192, 1964
- W. L. Fite, H. Harrison and D. G. Hummer
Velocity Dispersions of Square-Modulated Maxwellian Molecular Beams
Journal of Chemical Physics 41:2567(L), 1964
- W. L. Fite and R. T. Brackmann
Scattering of Hydrogen Atoms by D₂ Molecules
Journal of Chemical Physics 42:4057, 1965
- W. L. Fite, R. T. Brackmann and R. T. Henderson
Dissociative Attachment of Electrons to Hot O₂
Abstracts of Papers Presented at the IVth International Conference on the Physics of Electronic and Atomic Collisions, Quebec, August, 1965; Paper No. DA4, p. 100.
- R. T. Brackmann, W. L. Fite, W. R. Ott, J. K. Layton, R. F. Stebbings, J. A. Rutherford and P. Mahadevan
Charge Capture and Loss Cross Section for Al⁺ and Fe⁺ in Gases
Abstracts of Papers Presented at the IVth International Conference on the Physics of Electronic and Atomic Collisions, Quebec, August, 1965; Paper No. NB5, p. 326.

- Michael Fuller and Kazuo Kobayashi
 Identification of the Magnetic Phases Carrying Natural Remanent
 Magnetization in Certain Rocks
 Journal of Geophysical Research 69:4409, 1964
- Kazuo Kobayashi and Michael Fuller
 Origin of Thermoremanent Magnetization and Memory Phenomenon in
 Multidomain Materials
 Transactions of the American Geophysical Union 46:65, 1965
- Michael Fuller, C. G. A. Harrison and Y. R. Nayudu
 Magnetic and Petrologic Studies of the Sediment Found in Experimental
 Mohole Core EM7
 Bulletin of the American Association of Petroleum Geologists
 (in press)
- E. Gerjuoy
 Multiple-Wave Propagation and Causality
 Annals of Physics 1:1, 1965
- E. Gerjuoy
 Momentum Transfer Cross Section Theorem
 Journal of Mathematical Physics 6:993, 1965
- E. Gerjuoy
 Low Energy Electron-Atom and Electron-Molecule Scattering Theory
 Circa 1964
 Physics Today 18:24, 1965
- E. Gerjuoy
 Momentum Transfer Theorem for Inelastic Processes
 Journal of Mathematical Physics 6:1396, 1965
- Y. Inoue
 Physical Properties in the Outer Van Allen Belt and Their Relations to
 the Phenomena in the Exosphere
 Space Research. Proceedings of the 1st International Space Science
 Symposium, Nice, January 11-16, 1960. North-Holland Publishing
 Company, Amsterdam (1960), pp. 828-840.
- Y. Inoue
 Exospheric Radio Sounding (Abstract)
 Journal of Geomagnetism and Geoelectricity XII:116, 1961
- Y. Inoue and Samuel Horowitz
 Magneto-ionic Coupling in an Inhomogeneous, Anisotropic Medium
 AFCRL Report 1965 (in press)
- F. Kaufman
 Aeronomic Reactions Involving Hydrogen. A Review of Recent Laboratory
 Studies
 Annales de Géophysique 20:106, 1964
- F. Kaufman and J. R. Kelso
 Rate Constant of the Reaction $O + 2O_2 \rightarrow O_3 + O_2$
 Discussions of the Faraday Society 37:26, 1964

- F. A. Morse and F. Kaufman
Determination of Ground-State O, N, H by Light Absorption and
Measurement of Oscillator Strengths
Journal of Chemical Physics 42:1785, 1965
- G. H. Myers, F. Kaufman and D. M. Silver
The Quenching of NO₂ Fluorescence
Journal of Chemical Physics (in press; Jan. 1966)
- T. Nagata and S. Kokobun
Relation between Geomagnetic Disturbances in the Northern and
Southern Polar Regions
The Antarctic Record 11:924, 1961
- Takesi Nagata
Polar Geomagnetic Disturbances
Planetary and Space Science 11:1395, 1963
- R. Maeda, T. Rikitake and T. Nagata
Sudden Commencements of Geomagnetic Storms and Their Local Irregular-
ities
Journal of Geomagnetism and Geoelectricity 17:69, 1965
- W. L. Pilant and L. Knopoff
Observations of Multiple Seismic Events
Bulletin of the Seismological Society of America 54:19, 1964
- W. L. Pilant, L. Knopoff and F. Schwab
Transmission and Reflection of Surface Waves at a Corner. 3.
Rayleigh Waves (Experimental)
Journal of Geophysical Research 69:291, 1964
- E. I. Salkovitz, A. I. Schindler, N. G. Sakiotis and G. S. Ansell
Effects of Nuclear Irradiation upon the Microwave Properties of
Certain Ferrites. I. Low Frequency Behavior
International Union of Pure and Applied Physics in Electronics
and Telecommunications, Volume 4, Part 2, Academic Press, Inc.,
New York (1960), pp. 808-815.
- N. G. Sakiotis, E. I. Salkovitz and A. I. Schindler
Effects of Nuclear Irradiation upon the Microwave Properties of
Certain Ferrites. II. Microwave Behavior
International Union of Pure and Applied Physics in Electronics
and Telecommunications, Volume 4, Part 2, Academic Press, Inc.,
New York (1960), pp. 816-823.
- J. Ferguson and E. I. Salkovitz
Neutron-Diffraction Study of Pile-Irradiated Fe₃₀₄
Naval Research Laboratory Report, July, 1961
- J. G. Booth, R. I. Jaffee and E. I. Salkovitz
The Mechanisms of the Rhenium-Alloying Effect in Group VI-A Metals
Proceedings of the 5th Plansee Conference--Metals for the Space Age,
Reutte, Austria, June 22-25, 1964. (F. Benesovsky, ed.) Springer-
Verlag. Vienna (1965).

K. Yagi

Experimental Petrology on Pyroclastic Flows

Bulletin of the Volcano Society of Japan 8 (II):134, 1964

K. Yagi

The System Acmite-Diopside and Its Bearing on the Stability Relations of Natural Pyroxenes of the Acmite-Hedenbergite-Diopside Series

American Mineralogist 1965 (in press)

K. Yagi and K. Onuma

The System $\text{CaMgSi}_2\text{O}_6$ - $\text{CaTiAl}_2\text{O}_6$ with Special Reference to the Titanaugites

Mineralogical Journal (in press)

Edward C. Zipf, Jr.

Rocket Measurements of the Visible Dayglow

Journal of Geomagnetism and Geoelectricity (in press)